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U.S. PTO  
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: KUPPER et al.  
Docket: 13470.1399US01  
Title: USE OF LUBRICANTS BASED ON POLYSILOXANES

JC841 U.S. PTO  
09/06/00

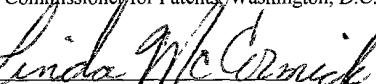
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CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EL 674896325US

Date of Deposit: September 10, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

By:   
Name: Linda McCormick

BOX PATENT APPLICATION  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:

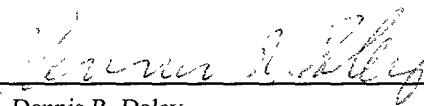
- Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- Utility Patent Application: Spec. 15 pgs; 22 claims; Abstract 1 pgs  
The fee has been calculated as shown below in the 'Claims as Filed' table.
- Certified copy of a German application, Serial No. 199 42 536.1, filed September 7, 1999, the right of priority of which is claimed under 35 U.S.C. 119
- An unsigned Combined Declaration and Power of Attorney
- A check in the amount of \$726.00 to cover the Filing Fee
- Other: Preliminary Amendment; courtesy copy of application in German; Submission of Priority Document
- Return postcard

CLAIMS AS FILED

Number of Claims Filed	In Excess of:	Number Extra	Rate	Fee
<b>Basic Filing Fee</b>				\$690.00
<b>Total Claims</b>				
22	- 20	= 2	x 18.00	= \$36.00
<b>Independent Claims</b>				
2	- 3	= 0	x 0.00	= \$0.00
<b>MULTIPLE DEPENDENT CLAIM FEE</b>				\$0.00
<b>TOTAL FILING FEE</b>				\$726.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

MERCHANT & GOULD P.C.  
P.O. Box 2903, Minneapolis, MN 55402-0903  
(612) 332-5300

By:   
Name: Dennis R. Daley  
Reg. No.: 34,994  
Initials: DRD:jjw



S/N Unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: KUPPER et al. Serial No.: Unknown  
Filed: Concurrent herewith Docket No.: 13470.1399US01  
Title: USE OF LUBRICANTS BASED ON POLYSILOXANES

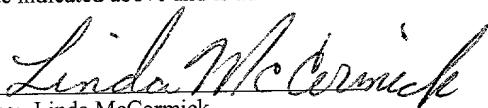
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By:   
Name: Linda McCormick

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment:

IN THE CLAIMS

In claim 4, line 1, please delete "any of claims 1 to 3" and insert --claim 1--.

In claim 6, line 1, please delete "claim 4 or 5" and insert --claim 4--.

In claim 8, line 1, please delete "any of claims 1 to 7" and insert --claim 1--.

In claim 9, line 1, please delete "any of claims 1 to 8" and insert --claim 1--.

In claim 11, line 1, please delete "any of claims 1 to 10" and insert --claim 1--.

In claim 12, line 1, please delete "any of claims 1 to 11" and insert --claim 1--.

In claim 12, line 4, please delete "any of claims 1 to 12" and insert --claim 1--.

In claim 13, line 1, please delete "any of claims 1 to 12" and insert --claim 1--.

In claim 16, line 1, please delete "any of claims 1 to 12" and insert --claim 1--.

In claim 17, line 1, please delete "any of claims 1 to 16" and insert --claim 1--.

In claim 18, line 1, please delete "any of claims 1 to 16" and insert --claim 1--.

In claim 19, line 1, please delete "any of claims 1 to 18" and insert --claim 1--.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 4, 6, 8, 9, 11, 12, 13, 16, 17, 18, and 19.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Dennis R. Daley (Reg. No. 34,994), at (612) 336-4689.

Respectfully submitted,

MERCHANT & GOULD P.C.  
P.O. Box 2903  
Minneapolis, Minnesota 55402-0903  
(612) 332-5300

Dated: September 6, 2000

By Dennis R. Daley  
Dennis R. Daley  
Reg. No. 34,994  
DRD:jjw

**“Use of Lubricants Based on Polysiloxanes”**

This invention relates to the use of polysiloxane-containing lubricant formulations. The invention also relates to lubricants containing polysiloxanes and other additives.

In the food industry and especially in beverage factories, the 5 containers to be filled in the bottling plants are conveyed by conveyors differing in design and constituent materials, for example by platform conveyors or chain-like arrangements which are generally referred to hereinafter as chain conveyors. The conveyors establish the connection between the various optional treatment stages of the bottling process such 10 as, for example, the unpacker, bottle washer, filler, closer, labeller, packer, etc. The containers may assume various forms, more particularly glass and plastic bottles, cans, glasses, casks, beverage containers (kegs), paper and paperboard containers. To guarantee uninterrupted operation, the conveyor chains have to be suitably lubricated to avoid excessive 15 friction with the containers. Dilute aqueous solutions containing suitable friction-reducing ingredients are normally used for lubrication. The chain conveyors are contacted with the aqueous solutions by dipping or spraying, for example, the corresponding lubrication systems being known as dip lubrication or automatic belt lubrication or central chain lubrication systems.

20 The chain lubricants hitherto used as lubricants are mostly based on fatty acids in the form of their water-soluble alkali metal or alkanolamine salts or on fatty amines, preferably in the form of their organic or inorganic salts.

25 Whereas both classes of substances can be used without difficulty in dip lubrication, they are attended by a number of disadvantages in the central chain lubrication systems typically in use today. Thus, **DE-A-23 13**

330 describes soap-based lubricants containing aqueous mixtures of C<sub>16-18</sub> fatty acid salts and surface-active substances. Soap-based lubricants such as these have the following disadvantages:

1. They react with the hardness ions in water, i.e. the alkaline earth metal ions, and other ingredients of water to form poorly soluble metal soaps, so-called primary alkaline earth metal soaps.
- 5 2. A reaction takes place between the soap-based lubricants and carbon dioxide dissolved in water or in the product to be bottled.
3. The in-use solution thus prepared is always germ-promoting.
- 10 4. Where hard water is used, ion exchangers have to be employed to soften the water which means an additional source of germs (and is therefore hardly encountered in practice) or, alternatively, products of high complexing agent content have to be used which is ecologically unsafe.
- 15 5. Increased foaming occurs which can cause problems in particular at the bottle inspector (automatic bottle control) and results in greater wetting of the transport containers.
6. Most of these products contain solvents.
7. The cleaning effect of the products is poor so that separate cleaning is necessary.
- 20 8. Corresponding soap-based lubricant preparations show pH-dependent performance.
9. In addition, soap-based lubricant preparations are dependent on the water temperature.
- 25 10. Soap-based lubricants show poor stability in storage, particularly at low temperatures.
11. The EDTA (ethylenediamine tetraacetate) present in many products is known to have poor biodegradability.
12. Soap-based lubricant preparations are not suitable for all plastic
- 30 transport containers because, in many cases, they give rise to stress

cracking in the transport container.

Besides soap-based lubricants, lubricants based on fatty amines are mainly used. Thus, **DE-A-36 31 953** describes a process for lubricating chain-type bottle conveyors in bottling factories, more particularly in breweries, and for cleaning the conveyors with a liquid cleaning composition, characterized in that the chain-type bottle conveyors are lubricated with belt lubricants based on neutralized primary fatty amines which preferably contain 12 to 18 carbon atoms and which have an unsaturated component of more than 10%.

10 **EP-A-0 372 628** discloses fatty amine derivatives corresponding to the following formulae:



in which

20  $\text{R}^1$  is a saturated or unsaturated, branched or linear alkyl group containing 8 to 22 carbon atoms,  
 $\text{R}^2$  is hydrogen, an alkyl or hydroxyalkyl group containing 1 to 4 carbon atoms or  $-\text{A}-\text{NH}_2$ ,  
 $\text{A}$  is a linear or branched alkylene group containing 1 to 8 carbon atoms  
25 and  
 $\text{A}^1$  is a linear or branched alkylene group containing 2 to 4 carbon atoms, as lubricants.

In addition, lubricants based on N-alkylated fatty amine derivatives which contain at least one secondary and/or tertiary amine are known from  
30 **DE-A-39 05 548**.

**DE-A-42 06 506** relates to soapless lubricants based on amphoteric

compounds, primary, secondary and/or tertiary amines and/or salts of such amines corresponding to general formulae (I), (IIa), (IIb), (IIIa), (IIIb), (IIIc), (IVa) and (IVb):



$$10 \quad \text{R}^4\text{-NH-R}^5 \quad (\text{IIa})$$

$$R^4-N^+H_2-R^5X^- \quad (IIb)$$

15 R<sup>4</sup>-NH-(CH<sub>2</sub>)<sub>3</sub>NH<sub>2</sub> (IIIa)

$$R^4\text{-NH-}(CH_2)_3N^+H_3 X^- \quad (IIIb)$$

$$R^4-N^+H_2-(CH_2)_3-N^+H_3 \ 2X^- \quad (IIIc)$$

$$20 \quad \text{R}^4\text{-NR}^7\text{R}^8 \quad (\text{IVa}) \quad \text{and/or}$$

$$R^4-N^+HR^7R^8X^- \quad (IVb)$$

25 in which

R is a saturated or mono- or polyunsaturated, linear or branched alkyl group containing 6 to 22 carbon atoms which may optionally be substituted by -OH, -NH<sub>2</sub>, -NH-, -CO-, -(CH<sub>2</sub>CH<sub>2</sub>O)<sub>i</sub>- or -(CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O)<sub>i</sub>-.

$R^1$  is hydrogen, an alkyl group containing 1 to 4 carbon atoms, a hydroxy-alkyl group containing 1 to 4 carbon atoms or a group  $-R^3COOM$ ,

$R^2$  is hydrogen, an alkyl group containing 1 to 4 carbon atoms or a hydroxyalkyl group containing 1 to 4 carbon atoms, but only where  $M^-$  represents a negative charge,

$R^3$  is a saturated or mono- or polyunsaturated, linear or branched alkyl group containing 1 to 12 carbon atoms which may optionally be substi-

tuted by -OH, -NH<sub>2</sub>, -NH-, -CO-, -(CH<sub>2</sub>CH<sub>2</sub>O)<sub>l</sub>- or -(CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O)<sub>l</sub>-,

R<sup>4</sup> is a substituted or unsubstituted, linear or branched, saturated or mono- or polyunsaturated alkyl group containing 6 to 22 carbon atoms which may contain at least one amine, imine, hydroxy, halogen and/or carboxy

5 group as substituent, a substituted or unsubstituted phenyl group which may contain at least one amine, imine, hydroxy, halogen, carboxy and/or a linear or branched, saturated or mono- or polyunsaturated alkyl group containing 6 to 22 carbon atoms as substituent,

R<sup>5</sup> is hydrogen or - independently of R<sup>4</sup> - has the same meaning as R<sup>4</sup>,

10 X<sup>-</sup> is an anion from the group consisting of amidosulfonate, nitrate, halide, sulfate, hydrogen carbonate, carbonate, phosphate or R<sup>6</sup>-COO<sup>-</sup> where

R<sup>6</sup> is hydrogen, a substituted or unsubstituted, linear or branched alkyl group containing 1 to 20 carbon atoms or alkenyl group containing 2 to 20 carbon atoms, which may contain at least one hydroxy, amine or

15 imine group as substituent, or a substituted or unsubstituted phenyl group which may contain an alkyl group with 1 to 20 carbon atoms as substituent, and

R<sup>7</sup> and R<sup>8</sup> independently of one another represent a substituted or unsubstituted, linear or branched alkyl group containing 1 to 20 carbon atoms or alkenyl group containing 2 to 20 carbon atoms which may contain at least one hydroxy, amine or imine group as substituent, or a substituted or unsubstituted phenyl group which may contain an alkyl group with 1 to 20 carbon atoms as substituent,

20 M is hydrogen, alkali metal, ammonium, an alkyl group containing 1 to 4 carbon atoms, a benzyl group or a negative charge,

n is an integer of 1 to 12,

m is an integer of 0 to 5 and

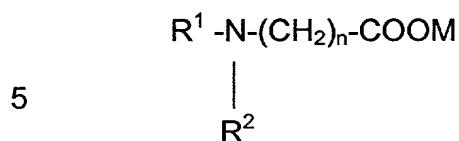
l is a number of 0 to 5,

containing alkyl dimethylamine oxides and/or alkyl oligoglycosides as

25 30 nonionic surfactants.

EP-B-629 234 discloses a lubricant combination consisting of

a) one or more compounds corresponding to the following formula:

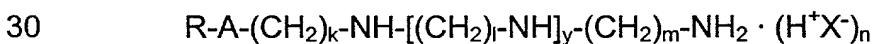


in which

10       $\text{R}^1$  is a saturated or mono- or polyunsaturated, linear or branched alkyl group containing 6 to 22 carbon atoms which may optionally be substituted by -OH, -NH<sub>2</sub>-, -NH-, -CO-, halogen or a carboxyl group,  
15       $\text{R}^2$  is a carboxyl group containing 2 to 7 carbon atoms,  
M is hydrogen, alkali metal, ammonium, an alkyl group containing 1 to 4 carbon atoms or a benzyl group and  
n is an integer of 1 to 6,  
b) at least one organic carboxylic acid selected from monobasic or polybasic, saturated or mono- or polyunsaturated carboxylic acids containing 2 to 22 carbon atoms,  
c) optionally water and additives and/or auxiliaries.

20      WO 94/03562 describes a lubricant concentrate based on fatty amines and optionally typical diluents or auxiliaries and additives, characterized in that it contains at least one polyamine derivative of a fatty amine and/or a salt of such an amine, the percentage content of the polyamine derivatives of fatty amines in the formulation as a whole being from 1 to 25 100% by weight.

In one preferred embodiment of WO 94/03562, this lubricant concentrate contains at least one polyamine derivative of a fatty amine corresponding to the following general formula:



in which

R is a substituted or unsubstituted, linear or branched, saturated or mono- or polyunsaturated alkyl group containing 6 to 22 carbon atoms, the substituents being selected from amino, imino, hydroxy, halogen and carboxy, or a substituted or unsubstituted phenyl group, the substituents being selected from amino, imino, hydroxy, halogen, carboxy and a linear or branched, saturated or mono- or polyunsaturated alkyl group containing 6 to 22 carbon atoms,

A represents either -NH- or -O-,

10 X<sup>-</sup> is an anion of an inorganic or organic acid,

k, l and m independently of one another are integers of 1 to 6,

y is 0, 1, 2 or 3 where A = -NH- or 1, 2, 3 or 4 where A = -O- and

n is an integer of 0 to 6.

The problem addressed by the present invention was to enable 15 conveyor belt installations to be lubricated with silicone-containing formulations, to further reduce water consumption and to achieve high material compatibility with plastic containers.

The present invention relates to the use of formulations containing at least 1% by weight and preferably at least 5% by weight, based on the 20 formulation as a whole, of at least one polysiloxane preferably selected from the groups of linear, branched, cyclic and crosslinked polysiloxanes for lubricating conveyor belt installations in the food industry, the formulations being applied to the conveyor belt installations directly, i.e. without dilution with water in the food factory, via an application system 25 which is preferably in direct contact with the surfaces to be lubricated during application or which, in another preferred embodiment, is in the form of a spray applicator. In one preferred use according to the invention, the formulations additionally contain at least one component selected from fluorine and polyhydroxy compounds and/or ethers and esters thereof.

30 Where fluorine compounds are used in the formulations to be used

PCT/EP2016/002068

in accordance with the invention, they are preferably selected from the groups of

5 a) perfluorinated or partly fluorinated monomeric organic compounds,  
b) pure and mixed dimers and oligomers based on at least one  
perfluorinated or partly fluorinated organic monomer,  
c) pure and mixed polymers based on at least one perfluorinated or partly  
fluorinated organic monomer.

According to the invention, the definition of the boundary between oligomers and polymers is based on the generally known characterization of polymers which are made up of so many identical or similar low molecular weight units (monomers) that the physical properties of these substances, particularly their viscoelasticity, do not change significantly when the number of units is increased or reduced by one unit. This is generally the case when the average molecular weight of the "polymers" is 10,000 g/mole or more.

The term oligomers is used for the low molecular weight dimers, trimers and other lower members of the polymer-homolog series.

In one preferred embodiment, the fluorine compounds a) comprise at least perfluorinated and partly fluorinated surfactants, alkanes, ethers and amines, the formulations used in accordance with the invention in one particularly preferred embodiment containing ammonium perfluoroalkyl sulfonates, lithium perfluoroalkyl sulfonates, potassium perfluoroalkyl sulfonates, amine perfluoroalkyl sulfonates, sodium perfluoroalkyl sulfonates, potassium fluoroalkyl carboxylates, quaternary fluorinated alkyl ammonium iodides, ammonium perfluoroalkyl carboxylates, fluorinated alkyl polyoxyethylene ethanols, fluorinated alkyl alkoxylates, fluorinated alkyl esters in concentrations of 0.001 to 10%. The fluorinated components of group c) are preferably perfluorinated and/or partly fluorinated alkoxy polymers which, in one particularly preferred embodiment, are obtainable from the copolymerization of tetrafluoroethylene and perfluoroalkoxyvinyl

ethers.

In another preferred embodiment, the formulations to be used in accordance with the invention contain at least perfluorinated and/or partly fluorinated polyethers from group c).

5 Where polyhydroxy compounds are used in the formulations to be used in accordance with the invention, they are preferably selected from the groups of polyalcohols and carbohydrates and, in one particularly preferred embodiment, from polyhydric alcohols, preferably alkanediols, alkanetriols and most preferably glycerol and the polyethers derived 10 therefrom and also glucose, arabinose, ribulose, fructose and the oligo- and/or polysaccharides derived therefrom and esters and ethers thereof.

In another preferred embodiment, the formulations to be used in accordance with the invention are present in the form of one-component liquids, solutions, gels, emulsions, pastes, dispersions.

15 In one preferred embodiment, the formulations to be used in accordance with the invention additionally contain at least one antimicrobial component selected from the groups of alcohols, aldehydes, antimicrobial acids, carboxylic acid esters, acid amides, phenols, phenol derivatives, diphenyls, diphenyl alkanes, urea derivatives, oxygen and nitrogen acetals and formals, benzamidines, isothiazolines, phthalimide derivatives, pyridine derivatives, antimicrobial surface-active compounds, guanidines, antimicrobial amphoteric compounds, quinolines, 1,2-dibromo-2,4-dicyanobutane, iodo-2-propynyl butyl carbamate, iodine, iodophors, peroxides, the formulations to be used in accordance with the invention in one particularly preferred embodiment containing one or more compounds selected from ethanol, n-propanol, i-propanol, butane-1,3-diol, phenoxyethanol, 1,2-propylene glycol, glycerol, undecylenic acid, citric acid, 2-benzyl-4-chlorophenol, 2,2'-methylene-bis-(6-bromo-4-chlorophenol), 2,4,4'-trichloro-2'-hydroxydiphenyl ether, N-(4-chlorophenyl)-N-(3,4-dichlorophenyl)-urea, 30 N,N'-(1,10-decanediyl)-1-pyridinyl-4-ylidene)-bis-(1-octaneamine)-dihydro-

chloride, N,N'-bis-(4-chlorophenyl)-3,12-diimino-2,4,11,13-tetraazatetradecane diimidoamide, quaternary ammonium compounds or alkyl amines, guanidines, amphoteric surfactants as antimicrobial components.

In another preferred embodiment, the formulations to be used in accordance with the invention contain other components selected from the groups of surfactants and solubilizing agents, at least one alkyl polyglycoside being present as surfactant in a particularly preferred embodiment. Other preferred constituents are fatty alkylamines and/or alkoxylates thereof, more particularly cocofatty amine ethoxylates, and/or imidazoline compounds and/or amphoteric surfactants and/or nonionic surfactants and/or ether carboxylic acids and/or ether amine compounds. In another preferred embodiment, paraffin compounds are added to the formulations to be used in accordance with the invention.

In practice, the formulations to be used in accordance with the invention are applied to the chain conveyors. In the most favorable case, the transport of the containers on the conveyors is not accompanied by foaming. By comparison with conventional lubricants which are diluted with water by a factor of more than 100 in automatic conveyor installations, the formulations to be used in accordance with the invention reduce frictional resistance between the conveyor and the containers transported thereon by more than 20% by for the same quantities by weight of active lubricating components applied to the conveyor installation over a certain period of time. This is demonstrated by the following Examples.

## 25   **Example 1**

A comparison formulation 1 which contains 5% by weight of coconut propylenediamine and which is adjusted to pH 7 with acetic acid is applied to the chain conveyors in a concentration in water of 0.2% through a nozzle block comprising five nozzles each capable of spraying 5 liters per hour. 30   50 ml of the comparison formulation or ca. 2.5 g of the coconut

propylenediamine are thus applied to the conveyor chains over a period of 1 hour. This test is carried out for 10 hours. According to the invention, the coefficient of friction between the bottles and the stainless steel conveyor chains is defined as the ratio of the tractive weight applied, for example, to 5 a spring balance when an attempt is made to hold a bottle still while the conveyor is moving to the weight of that bottle.

Where the Comparison Example described above is used, the coefficient of friction  $\mu$  is 0.10. When spraying is stopped, the friction coefficient increases rapidly and the bottles fall over after only a few 10 minutes.

In the Comparison Example, a total of 25 ml of lubricating coconut propylenediamine raw materials is applied to the conveyor chains over the total test duration of 10 hours. In a second test, 25 ml of a formulation to be used in accordance with the invention consisting of a 35% aqueous 15 polydimethyl siloxane dispersion is distributed over the chain conveyors with a cloth. The coefficient of friction between the bottles and the chain conveyor is then measured over a period of 10 hours under exactly the same conditions as in Comparison Example 1. The coefficient of friction  $\mu$  is about 0.05 over the entire test duration of 10 hours. This Example 20 shows that the friction coefficient between the bottles and the conveyor system can be reduced by more than 20% and, in the present case, even by more than 40%.

Another preferred embodiment of the present invention is the use of the formulations to be used in accordance with the invention for the 25 conveying of plastic containers, the plastic containers in one particularly preferred embodiment containing at least one polymer selected from the groups of polyethylene terephthalates (PET), polyethylene naphthenates (PEN), polycarbonates (PC), PVC. In one most particularly preferred embodiment, the containers are PET bottles.

### Example 2

In a laboratory test, the stress cracking of a Comparison Example based on 5% by weight coconut propylene diamine and 5% by weight dimethyl lauryl amine adjusted to pH 7 with acetic acid is measured by comparison with the stress cracking of a 25% aqueous polydimethyl siloxane dispersion.

According to the test specification, PET bottles are filled with water and conditioned with carbon dioxide in such a way that a pressure of about 7 bar is present inside the bottles. The base cups of the bottles are then 10 dipped in the formulation of the Comparison Example and the Example to be used in accordance with the invention and are placed in a Petri dish for 24 hours. Thereafter the bottles are opened, emptied and their base cups are rinsed with water. Visual inspection of the base cups of the bottles shows that, in the test with the Comparison Example, many stress cracks 15 of average depth (classification C) are present whereas the test with the Example to be used in accordance with the invention produces only a few stress cracks of minimal depth (classification A). The stress cracks are classified in accordance with the reference images appearing in Chapter IV-22 of the book entitled "**CODE OF PRACTICE - Guidelines for an**

Example 2 shows that the formulations to be used in accordance with the invention have advantages over typical commercial amine-based products used as lubricants in the conveying of plastic bottles.

25 In another preferred embodiment, the formulations to be used in accordance with the invention are used for conveying paperboard packs.

In another preferred use, the conveying surfaces of the conveyor belts are made of plastic - in one particularly preferred embodiment of polyacetal and polyethylene.

30 In another preferred embodiment, the conveying surfaces of the

conveyor belt are made of metal - in one particularly preferred embodiment stainless steel.

In another preferred embodiment, additional antimicrobial agents, more particularly organic peracids, chlorine dioxide or ozone, are additionally incorporated in the formulations to be used in accordance with the invention through separate feed systems either before or after application of the formulations.

In another preferred embodiment, the formulations to be used in accordance with the invention are applied to the conveyor belts without dilution with water using an aid selected from paint brushes, sponges, rollers, cloths, brushes, wipers, rubber, spray nozzles. In another preferred embodiment, the formulations to be used in accordance with the invention are diluted with water in automatic conveyor systems and the resulting solution is applied to the conveyors through metering systems, the dilution factor being between 10,000 and 100. In another preferred embodiment, the formulations to be used in accordance with the invention are selected and applied in such a way that there is no further proliferation of microorganisms on surfaces in contact with the formulations or solution. In one most particularly preferred embodiment, the number of microorganisms is reduced.

The present invention also relates to chain lubricants which, based on the formulation as a whole, contain at least 1% by weight and preferably at least 5% by weight of at least one polysiloxane and, in addition, at least one polyhydroxy compound and/or an organic fluorine compound, the sum total of polysiloxane and polyhydroxy compound and/or organic fluorine compound making up at least 15% by weight of the formulation as a whole in one preferred embodiment.

Where fluorine compounds are used in the formulations to be used in accordance with the invention, they are preferably selected from the groups of

PCT/EP2009/052650

- a) perfluorinated or partly fluorinated monomeric organic compounds,
- b) pure and mixed dimers and oligomers based on at least one perfluorinated or partly fluorinated organic monomer,
- c) pure and mixed polymers based on at least one perfluorinated or partly fluorinated organic monomer.

5 According to the invention, the definition of the boundary between oligomers and polymers is based on the generally known characterization of polymers which are made up of so many identical or similar low molecular weight units (monomers) that the physical properties of these 10 substances, particularly their viscoelasticity, do not change significantly when the number of units is increased or reduced by one unit. This is generally the case when the average molecular weight of the "polymers" is 10,000 g/mole or more.

15 The term oligomers is used for the low molecular weight dimers, trimers and other lower members of the polymer-homolog series.

In one preferred embodiment, the fluorine compounds a) comprise at least perfluorinated and partly fluorinated surfactants, alkanes, ethers and amines, the formulations used in accordance with the invention in one particularly preferred embodiment containing ammonium perfluoroalkyl 20 sulfonates, lithium perfluoroalkyl sulfonates, potassium perfluoroalkyl sulfonates, amine perfluoroalkyl sulfonates, sodium perfluoroalkyl sulfonates, potassium fluoroalkyl carboxylates, quaternary fluorinated alkyl ammonium iodides, ammonium perfluoroalkyl carboxylates, fluorinated alkyl polyoxyethylene ethanols, fluorinated alkyl alkoxylates, fluorinated 25 alkyl esters in concentrations of 0.001 to 10%. The fluorinated components of group c) are preferably perfluorinated and/or partly fluorinated alkoxy polymers which, in one particularly preferred embodiment, are obtainable from the copolymerization of tetrafluoroethylene and perfluoroalkoxyvinyl ethers.

30 In another preferred embodiment, the formulations to be used in

accordance with the invention contain at least perfluorinated and/or partly fluorinated polyethers from group c).

Where polyhydroxy compounds are used in the formulations to be used in accordance with the invention, they are preferably selected from the groups of polyalcohols and carbohydrates and, in one particularly preferred embodiment, from polyhydric alcohols, preferably alkanediols, alkanetriols and most preferably glycerol and the polyethers derived therefrom and also glucose, arabinose, ribulose, fructose and the oligo- and/or polysaccharides derived therefrom and esters and ethers thereof.

The advantage of the use according to the invention and of the chain lubricants according to the invention is that water consumption is significantly reduced. Since the belt lubricating solution is not collected and re-used in the prior art, the process in use today involves an enormous waste of resources. Another advantage is that, providing it is properly applied, hardly any of the formulation drips onto the floor. This results in greater safety and in purely visual advantages in the factory. In addition, soil occurring has sometimes been seen to be repelled by the conveyor belts conditioned with the formulation.

Die Siedlung wurde 1906 unter dem Namen "Königlich Böhmisches Dorf" gegründet.

**CLAIMS**

1. The use of formulations containing at least 1% by weight, based on the formulation as a whole, of at least one polysiloxane for lubricating conveyor belt installations in the food industry, the formulations being applied to the conveyor belt installations directly, i.e. without dilution with water in the food factory, via an application system.

5

2. The use claimed in claim 1, characterized in that the application system is in direct contact with the surfaces to be lubricated during application.

10 3. The use claimed in claim 1, characterized in that a spray applicator is used as the application system

4. The use claimed in any of claims 1 to 3, characterized in that the formulations additionally contain at least one component selected from fluorine and polyhydroxy compounds and/or ethers and esters thereof.

15 5. The use claimed in claim 4, characterized in that a fluorine compound selected from the groups of

- a) perfluorinated or partly fluorinated monomeric organic compounds,
- b) pure and mixed dimers and oligomers based on at least one perfluorinated or partly fluorinated organic monomer,

20 c) pure and mixed polymers based on at least one perfluorinated or partly fluorinated organic monomer

is present.

6. The use claimed in claim 4 or 5, characterized in that at least one component selected from from polyhydric alcohols, preferably alkanediols or alkanetriols, and the polyethers derived therefrom and from carbohydrates, preferably glucose, arabinose, ribulose, fructose and the oligo- and/or polysaccharides derived therefrom and esters and ethers thereof is present as the polyhydroxy compound.

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7. The use claimed in claim 6, characterized in that glycerol at least is present as the polyhydroxy compound.

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8. The use claimed in any of claims 1 to 7, characterized in that the formulations are present in the form of a one-component liquid, solution, gel, emulsion, paste or dispersion.

9. The use claimed in any of claims 1 to 8, characterized in that the 5 formulations additionally contain at least one antimicrobial component selected from the groups of alcohols, aldehydes, antimicrobial acids, carboxylic acid esters, acid amides, phenols, phenol derivatives, diphenyls, diphenyl alkanes, urea derivatives, oxygen and nitrogen acetals and formals, benzamidines, isothiazolines, phthalimide derivatives, pyridine 10 derivatives, antimicrobial surface-active compounds, guanidines, antimicrobial amphoteric compounds, quinolines, 1,2-dibromo-2,4-dicyanobutane, iodo-2-propynyl butyl carbamate, iodine, iodophors, peroxides.

10. The use claimed in claim 9, characterized in that the formulations contain one or more compounds selected from ethanol, n-propanol, i- 15 propanol, butane-1,3-diol, phenoxyethanol, 1,2-propylene glycol, glycerol, undecylenic acid, citric acid, 2-benzyl-4-chlorophenol, 2,2'-methylene-bis-(6-bromo-4-chlorophenol), 2,4,4'-trichloro-2'-hydroxydiphenyl ether, N-(4-chlorophenyl)-N-(3,4-dichlorophenyl)-urea, N,N'-(1,10-decanediyl-1-pyridinyl-4-ylidene)-bis-(1-octaneamine)-dihydrochloride, N,N'-bis-(4-chlorophenyl)-3,12-diimino-2,4,11,13-tetraazatetradecane diimidoamide, 20 quaternary ammonium compounds or alkyl amines, guanidines, amphoteric surfactants as antimicrobial components.

11. The use claimed in any of claims 1 to 10, characterized in that the formulations contain additional components selected from the groups of 25 surfactants and solubilizing agents.

12. The use claimed in any of claims 1 to 11, characterized in that, by comparison with conventional lubricants which are diluted with water by a factor of more than 100 in automatic conveyor installations, the formulations according to any of claims 1 to 12 reduce the frictional 30 resistance between the conveyor and the containers transported thereon

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by more than 20% by for the same quantities by weight of active lubricating components applied to the conveyor installation over a certain period of time.

13. The use claimed in any of claims 1 to 12 for the conveying of plastic  
5 containers.

14. The use claimed in claim 13, characterized in that the plastic containers contain at least one polymer selected from the groups of polyethylene terephthalates (PET), polyethylene naphthenates (PEN), polycarbonates (PC), PVC.

10 15. The use claimed in claim 14, characterized in that the plastic  
containers are PET bottles.

16. The use claimed in any of claims 1 to 12 for the conveying of paperboard packs.

17. The use claimed in any of claims 1 to 16, characterized in that the  
15 conveying surfaces of the conveyor system are made of plastic.

18. The use claimed in any of claims 1 to 16, characterized in that the contact surfaces of the conveyor system are made of metal.

19. The use claimed in any of claims 1 to 18, characterized in that additional antimicrobial agents are separately added during application.

20 20. The use claimed in claim 19, characterized in that an organic peracid, chlorine dioxide or ozone is used as the antimicrobial agent.

21. Chain lubricants which, based on the formulation as a whole, contain at least 1% by weight of at least one polysiloxane and, in addition, at least one polyhydroxy compound and/or an organic fluorine compound.

25 22. A chain lubricant as claimed in claim 21, characterized in that the sum total of polysiloxane and polyhydroxy compound and/or organic fluorine compound makes up at least 15% by weight of the formulation as a whole.

## Abstract

## **“Use of Lubricants Based on Polysiloxanes”**

The invention relates to the use of at least one polysiloxane in lubricant formulations for reducing friction between conveyor belts and the articles transported thereon. The invention also relates to lubricants containing other additives besides polysiloxane.

## United States Patent Application

## COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: USE OF LUBRICANTS BASED ON POLYSILOXANES

The specification of which

- a.  is attached hereto
- b.  was filed on as application serial no. and was amended on (if applicable) (in the case of a PCT-filed application) described and claimed in international no. filed and as amended on (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (attached hereto).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

- a.  no such applications have been filed.
- b.  such applications have been filed as follows:

## FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)
Germany	199 42 536.1	7 September 1999	

## ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

Albrecht, John W.	Reg. No. 40,481	Lacy, Paul E.	Reg. No. 38,946
Ali, M. Jeffer	Reg. No. 46,359	Larson, James A.	Reg. No. 40,443
Anderson, Gregg I.	Reg. No. 28,828	Leon, Andrew J.	Reg. No. P-46,869
Batzli, Brian H.	Reg. No. 32,960	Liepa, Mara E.	Reg. No. 40,066
Beard, John L.	Reg. No. 27,612	Lindquist, Timothy A.	Reg. No. 40,701
Berns, John M.	Reg. No. 43,496	Lycke, Lawrence E.	Reg. No. 38,540
Black, Bruce E.	Reg. No. 41,622	McAuley, Steven A.	Reg. No. 46,084
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Bruess, Steven C.	Reg. No. 34,130	Mueller, Douglas P.	Reg. No. 30,300
Byrne, Linda M.	Reg. No. 32,404	Pauly, Daniel M.	Reg. No. 40,123
Campbell, Keith	Reg. No. P-46,597	Phillips, Bryan K.	Reg. No. P-46,990
Carlson, Alan G.	Reg. No. 25,959	Phillips, John B.	Reg. No. 37,206
Caspers, Philip P.	Reg. No. 33,227	Plunkett, Theodore	Reg. No. 37,209
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Daley, Dennis R.	Reg. No. 34,994	Reich, John C.	Reg. No. 37,703
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Epp-Ryan, Sandra	Reg. No. 39,667	Sebald, Gregory A.	Reg. No. 33,280
Glance, Robert J.	Reg. No. 40,620	Skoog, Mark T.	Reg. No. 40,178
Goggins, Matthew J.	Reg. No. 44,125	Spellman, Steven J.	Reg. No. 45,124
Golla, Charles E.	Reg. No. 26,896	Stoll-DeBell, Kirstin L.	Reg. No. 43,164
Gorman, Alan G.	Reg. No. 38,472	Sumner, John P.	Reg. No. 29,114
Gould, John D.	Reg. No. 18,223	Swenson, Erik G.	Reg. No. 45,147
Gregson, Richard	Reg. No. 41,804	Tellekson, David K.	Reg. No. 32,314
Gresens, John J.	Reg. No. 33,112	Trembath, Jon R.	Reg. No. 38,344
Hamer, Samuel A.	Reg. No. P-46,754	Tuchman, Ido	Reg. No. 45,924
Hamre, Curtis B.	Reg. No. 29,165	Underhill, Albert L.	Reg. No. 27,403
Harrison, Kevin C.	Reg. No. P-46,759	Vandenburgh, J. Derek	Reg. No. 32,179
Herzberg, Brett A.	Reg. No. 42,660	Wahl, John R.	Reg. No. 33,044
Hillson, Randall A.	Reg. No. 31,838	Weaver, Karrie G.	Reg. No. 43,245
Holzer, Jr., Richard J.	Reg. No. 42,668	Welter, Paul A.	Reg. No. 20,890
Johnston, Scott W.	Reg. No. 39,721	Whipps, Brian	Reg. No. 43,261
Kadievitch, Natalie D.	Reg. No. 34,196	Whitaker, John E.	Reg. No. 42,222
Karjeker, Shaukat	Reg. No. 34,049	Wickhem, J. Scot	Reg. No. 41,376
Kastelic, Joseph M.	Reg. No. 37,160	Williams, Douglas J.	Reg. No. 27,054
Kettelberger, Denise	Reg. No. 33,924	Witt, Jonelle	Reg. No. 41,980
Keys, Jeramie J.	Reg. No. 42,724	Wu, Tong	Reg. No. 43,361
Knearl, Homer L.	Reg. No. 21,197	Xu, Min S.	Reg. No. 39,536
Kowalchyk, Alan W.	Reg. No. 31,535	Zeuli, Anthony R.	Reg. No. 45,255
Kowalchyk, Katherine M.	Reg. No. 36,848		

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould P.C. to the contrary.

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Merchant & Gould P.C.  
P.O. Box 2903  
Minneapolis, MN 55402-0903



I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	Full Name Of Inventor	Family Name KÜPPER	First Given Name Stefan	Second Given Name
0	Residence & Citizenship	City Langenfeld	State or Foreign Country Germany	
1	Post Office Address	Post Office Address Im Schaufsfeld 8	City Langenfeld	State & Zip Code/Country 40764 Germany
Signature of Inventor 201:			Date:	
2	Full Name Of Inventor	Family Name SCHNEIDER	First Given Name Michael	Second Given Name
0	Residence & Citizenship	City Jüchen	State or Foreign Country Germany	
2	Post Office Address	Post Office Address Am Steenblenk 6	City Jüchen	State & Zip Code/Country 41363 Germany
Signature of Inventor 202:			Date:	
2	Full Name Of Inventor	Family Name GROßE BÖWING	First Given Name Walter	Second Given Name
0	Residence & Citizenship	City Dormagen	State or Foreign Country Germany	
3	Post Office Address	Post Office Address Melanderstr. 23	City Dormagen	State & Zip Code/Country 41541 Germany
Signature of Inventor 203:			Date:	
2	Full Name Of Inventor	Family Name LAUFENBERG	First Given Name Alfred	Second Given Name
0	Residence & Citizenship	City Dormagen	State or Foreign Country Germany	
4	Post Office Address	Post Office Address Urdenbacher Str. 13	City Dormagen	State & Zip Code/Country 41541 Germany
Signature of Inventor 204:			Date:	
2	Full Name Of Inventor	Family Name KLUSCHANZOFF	First Given Name Harald	Second Given Name
0	Residence & Citizenship	City Mettmann	State or Foreign Country Germany	
5	Post Office Address	Post Office Address Klutenscheuer 22	City Mettmann	State & Zip Code/Country 40822 Germany
Signature of Inventor 205:			Date:	

## § 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

- (1) prior art cited in search reports of a foreign patent office in a counterpart application, and
- (2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

- (1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim;
- (2) It refutes, or is inconsistent with, a position the applicant takes in:
  - (i) Opposing an argument of unpatentability relied on by the Office, or
  - (ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

- (1) Each inventor named in the application;
- (2) Each attorney or agent who prepares or prosecutes the application; and
- (3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.